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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/796,071
Filing Date: March 10, 2004
Appellant(s): SUTHERLAND ET AL.

Dawn-Marie Bey (44,442)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed September 20, 2006 (duplicate of 9/19/07 filing) appealing from the Office action mailed March 7, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

0087281	Ikeda et al.	08/1983
4,818,045	Chang	04/1989
4,938,568	Margerum et al.	07/1990
98/04650	Sutherland et al.	02/1998
03-188479	Eguchi et al.	08/1991
5,529,861	Redfield	06/1996
5,499,188	Wreede et al.	03/1996
3,667,946	Sturdevant	06/1972

Caulfield et al. "The applications of Holography", pp. 66-69 (1970)

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

A) Claim 49-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang '045, in view of Ikeda et al. EP 0087281, Sutherland et al. WO98/04650, Margerum et al. '568 and Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69.

Chang '045 discloses the formation of edge faded holograms, where the diffraction efficiency decreases from the center toward the periphery. This reduces the visibility of the edges of the hologram, thereby reducing the obstructions to visibility of the driver (1/28-30, 1/50-54 and 2/10-13). This method reduces the coherence of the laser light used in the two beam exposure process so that equal amounts of expose occur throughout the holographic recording

medium, but the percentage of interferometric exposure is reduced at the edges (5/42-67, 7/59-67 and 8/5-19). The reduced coherence light fails to form interference patterns and yields an essentially incoherent (uniform) exposure at the edges. (2/40-48). The formation of volume holograms, where the interference fringes are recorded within the photosensitive material is disclosed (5/5-8). The use of dichromated gelatin is disclosed. (4/67-5/1)

Ikeda et al. EP 0087281 teaches with respect to figure 5 a master hologram, which is placed in close contact with a photosensitive layer and exposed to form a copy hologram. Figure 6 shows the formation of the diffracted beam and the passage of some of the transmitted beam, which acts as a reference beam. Figure 15-17 show scanning of the laser beam. The formation of holograms which exhibit refractive index variations in the recording layer are phase volume holograms. (6/3-9 and 8/30-36). The diffraction efficiency of the copy can be controlled by properly choosing the incident angle of the copy beam (11/1-4and 15/19-25).

Sutherland et al. WO98/04650 teaches PDLC holographic recording media, which are used to record volume holographic gratings with electrically variable diffraction efficiency. The use of two beam exposure processes with these materials is disclosed. (8/15-30 and 9/19-33) . The compositions are disclosed as using a photopolymerizable monomer, a second phase material, a photoinitiator, a co-initiator, a chain extender (or crosslinker) and optionally a surfactant. Useful photopolymerizable materials including mixtures of di, tri, tetra and penta acrylates, such as triethylethylene glycol diacrylate, trimethyolpropane triacrylate, pentaerythritol triacrylate, pentaerythritol tetracrylate, pentaerythritol pentacrylate and the like. (10/14-27) The use of dipentaerythritol hydroxypentacrylate is disclosed. (11/12). Useful second phase materials are described as LC materials and include E7 and cyanobiphenyls (10/28-11/26

and 19/1-22/16) . Useful photoinitiators including rose Bengal esters, fluoresceins, cyanine dyes are disclosed. (11/36-12/16) Useful co-initiators including N-phenyl glycine are disclosed. (12/17-32) Useful crosslinker/chain extenders including vinyl monomers, such as N-vinyl pyrrolidone are disclosed. (12/33-13/8) Surfactants lower the operating voltage and useful surfactants include octanoic acid. (13/9-14/13). The recording media are placed between ITO coated slides as discussed on pages 15 and 11 and through application of voltage through these ITO electrodes are electrically switchable to control the birefringence and transmittance of the LC material within the cured polymeric matrix. Useful amounts of the various components are disclosed on page 17. The stacking of these containing multiple gratings is disclosed on page 28 with respect to figure 17. The disclosure of these for application where holographic images are desired to be switchable is disclosed. (28/31-29/3). The formation of either reflection or transmission switchable holograms is disclosed (4/30-32). A holographic mirror is recorded using a laser to produce the incident reference beam and a mirror on the opposite side the recording medium to reflect the reference beam back through the recording medium to form the object beam, which interferes with the reference beam to form the interference fringes (17/1-12). The formation of static holograms from previously switchable holograms can be achieved by using solvents to remove the liquid crystals. (29/4-22).

Margerum et al. '568 teach the use of a contact exposure through a grating mask to form diffraction gratings in PDLC recording materials. The use of a second exposure after the masked exposure is also disclosed with respect to figure 1. (5/5-57) The alternative use of a two beam holographic interference exposure is disclosed. (5/53-57, 2/27-31 and 2/54-59) The PDLC

materials are coated between ITO coated glass films. (4/57-5/57). The recording of holographic patterns is emphasized. (11/33-41).

Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 teaches copying holograms to produce multiple copies of a mass market, to form copies for uses which might damage the hologram, to change the type/composition of recording medium which the hologram is recorded in, to change the hologram to a different form or record a processed image. The use of contact copying processes is disclosed. For duplicating a transmission hologram, the holographic master is between the recording medium and the incoming reconstruction beam, where the off axis beams are the first order diffraction (VII-2a) and for duplicating a reflection hologram, the recording medium is between the holographic master and the incoming reconstruction beam, where the off axis beam is the first order diffraction (VII-2b).

It would have been obvious to one skilled in the art to modify the process of forming edge faded holograms taught by Chang '045 by using contact copy methods such as those disclosed by Ikeda et al. EP 0087281 to obviate the need to a two beam exposure apparatus and to use the PDLC holograms of Sutherland et al. WO98/04650 as the master transmission hologram and as the duplicate material and to vary the diffraction efficiency of the holographic master based upon the location of the beam to form edge faded holograms to obviate the need for diffusers or varying the angle of the beam as a function of the location of the laser beam used in the scanning copy process of Ikeda et al. EP 0087281 with a reasonable expectation of forming a edge faded hologram with the desired diffraction efficiency distribution in a PDLC holographic recording medium, which can be turned on or off. The examiner cites Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 to establish that contact copying is old and well

known, Ikeda et al. EP 0087281 to evidence that this extends to volume holographic recording media, Margerum et al. '568 which evidences contact exposure through a diffractive grating mask to form volume holographic patterns in PDLC recording materials. Sutherland et al. WO98/04650 where a holographic mirror is recorded using a laser to produce the incident reference beam and a mirror on the opposite side the recording medium to reflect the reference beam back through the recording medium to form the object beam, which interferes with the reference beam to form the interference fringes (17/1-12) effectively demonstrates the use of an adjacent optical element to generate the object beam for volume holographic recording. The resultant PDLC volume hologram would be modified in the non-uniform diffraction efficiency relative to the master PDLC hologram, which relates to the motivation to change the hologram to a different form as motivation to use a copying process. The electrical control of the diffraction efficiency in a PDLC is clearly easier that moving a diffuser as taught by Chang '045 or varying the incident angle of the replay beam taught by Ikeda et al. EP 0087281 to generate the areas of reduced diffraction efficiency.

In addition to the basis provided above, the examiner notes that it would have been obvious to modify the resultant process by reversing the positions of the PDLC holographic master and the PDLC recording material and to use of reflection PDLC holographic master, rather than a transmission PDLC holographic master to form a edge faded reflection PDLC hologram based upon the teachings of Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 regarding the use of contact exposure copying methods which is also old and well known. The examiner further notes that the use of an optical element (ie a mirror) to form an object beam is shown in Sutherland et al. WO98/04650 and from simple inspection, the

position of the mirror in the cited portion of Sutherland et al. WO98/04650 is analogous to that of the holographic master in figure VII-2b of Caulfield, et al. "The Applications of Holography", (1970). In the case Chang '045, interference pattern formation is prevented at the edges by rendering the percentage of exposure less coherent in these areas which is the same effect achieved by reducing the diffraction efficiency of the grating when exposure of the edge regions occurs as more of the light merely passes through the hologram when the diffraction efficiency is reduced and by further replacing the holographic recording material of Ikeda et al. EP 0087281 or Chang '045 with a PDLC holographic recording material to produce a switchable hologram with faded edges so that it could be turned off when it was not desired to be in the drivers view and processing without the need for wet development.

The method and apparatus claims are directed to contact copying of holograms, where the master hologram is electrically controllable (such as a PDLC hologram) and the holographic recording materials is a PDLC holographic recording material. The applicant correctly states that no (one) reference meets all the limitations of the claims. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The applicant raises none of the references showing the use of an electronically switchable hologram as the master splitting a single beam to generate the interference pattern. The examiner notes that the PDLC holograms of Sutherland et al. WO98/04650 are volume holograms and as such inherently generate diffracted beam(s) as shown with respect to the holographic masters of Ikeda et al. EP 0087281 and Caulfield, et al. "The

Applications of Holography", (1970) and analogous to the diffraction grating of Margerum et al. '568. The applicant seems to neglect the fact that holograms are diffractive articles, which inherently diffract light (when on). The examiner notes that and Caulfield, et al. "The Applications of Holography", (1970) specifically points out that the holographic master is replayed by the replay/reconstruction beam in the contact copying process. The PDLC materials of Sutherland et al. WO98/04650 can certainly be replayed when turned on and would therefore be able to be used as holographic masters. When in the off condition, no diffracted beams would be generated by the PDLC, no interference patterns would be generated and the exposure would be essentially uniform, which is recognized by Sutherland et al. WO98/04650. The functionality of the PDLC materials, desirability for PDLC holograms, which are electronically switchable and the use of contact exposure processes are clearly known in the art. The final question is if there is a reason to combine these. The formation of edge-faded holograms requires both interferometric exposure and non-interferometric exposure. In the prior art, this maybe achieved while using a laser for both exposures by the use of a diffuser placed in the beam path (Chang '045), adjusting the angle of the replay/reconstruction beam (Ikeda et al. EP 0087281) or not turning the PDLC hologram on (Sutherland et al. WO98/04650, leaving the beam undiffracted which is equivalent to the fixation exposure of Redfield '861). Of these, clearly the easiest is modulating the PDLC material, which provides incentive to use a PDLC material as the diffractive master and more easily enable the edge diffracted PDLC hologram to be formed. The resultant PDLC volume hologram would be modified in the non-uniform diffraction efficiency relative to the master PDLC hologram, which relates to the motivation to change the hologram to a different form as motivation to use a copying process discussed by Caulfield, et al. "The

Applications of Holography", (1970). In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). As discussed above, the functionality, motivation and benefits are recognized in the prior art and therefore the hindsight is not impermissible.

With respect to claims 80-90, the applicant is asserting that conventional PDLC holograms made using single step processes result in limited only larger droplet sizes on the basis of the specification in section [0042]. What is unclear is what is meant by "conventional PDLC materials made using a single step". Perhaps this applies to PDLC materials where the polymer is not formed insitu, but is merely mixed together with the LC material to form a PDLC material. The examiner notes that Sutherland et al. WO98/04650 and Margerum et al. '568 both use the insitu polymerization technique and the argument fails to account for this, particularly in view of Sutherland using the same composition as the claimed invention.

In response to the arguments of 12/19/05, the applicant's arguments fail to appreciate that the use of contact copying methods for holograms is old and well known in the art. In this process, the incident replay/copy beam is divided into a diffracted beam and an undiffracted beam (two beams), which parallels the conventional two beam exposure process (Ikeda et al. and Caulfield) . With static holograms, the diffraction efficiency within a single area is fixed (static)

and so to reduce the diffraction efficiency, the incident angle of the copy beam is varied to reduce the efficiency of the formation of the diffracted beam. (see Ikeda et al. EP 0087281). It is important to note that in holographic copying processes, the master hologram is replayed toward the photosensitive layer in the same manner as it were to be viewed except that the image is capture by the photosensitive layer, rather than the viewer's eye. A diffraction grating mask used in a contact exposure process functions in the same manner (Margerum et al. '568 at col 5) and a the prior use of the diffraction grating with PDLC holographic recording materials in contact copying provides a reasonable expectation that a similar process using a holographic diffraction would be successful as they are analogeous. With respect to the PDLC holograms these are replayed in the same manner as other holograms, but due to the presence of the LC materials in these, the diffraction efficiency can be varied by application of an electric field which changes the orientation of the LC materials (Sutherland et al. WO 98/04650 throughout including ITO slides at pages 11 and 15). To make these static, the removal of the LC materials using a solvent is all that is required, which establishes that the teachings of these references concerning static and variable holograms are properly considered to be analogous. (Sutherland et al. WO 98/04650 at col 29.). The position of the examiner is that using a holograms, such as the electrically switchable holograms of Sutherland et al. WO 98/04650 as the master would allow control of the diffraction efficiency of the replica/copy by direct control of the diffraction efficiency of the master being copied as the beam is scanned across the surface, rather than controlling the incident angle of the replay/copy beam as taught by Ikeda et al. EP 0087281. Other than the ability to control the diffraction efficiency due to the presence of the LC materials dispersed within the hologram, the holograms static or variable, replay in the same manner and

therefore would be expected by one of ordinary skill in the art to be replayed in contact with a holographic recording material to form a duplicate using a contact copying process. The direct control of the diffraction efficiency of the master is simpler (merely changing voltage) than precisely controlling the incident angle of the replay beam. Furthermore, the desirability of edge faded holograms in heads-up displays in windshield and the like is taught by Chang '045 and thereby providing a motivation for forming them. Clearly the ease in forming a hologram with varying diffraction efficiency by merely varying the voltage is simpler to control /implement than the methods taught by Chang '045 or Ikeda et al. EP 0087281 and provides motivation to use variable holograms as masters in the manner claimed and set forth in the rejection above.

On page 8 of the reply, the applicant has misunderstood the position of the examiner with respect to Chang '045. Change is the desired result (ie a hologram with a varied diffraction efficiency) and the rejection describes using the contact copying process of Ikeda et al. by replacing the static master with a variable diffraction PDLC hologram, such as that of Sutherland et al. WO98/04650 so that the variation in the diffraction efficiency of the copy hologram can be controlled by varying the voltage, rather than the incident angle of the replay/copy beam. The discussion of Margerum et al. '568 and Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 is to establish through evidence in the record a firm basis concerning the high likelihood of success to one of ordinary skill in the art. The applicant's discussion on page 10 of the examiner's detailed position is essentially correct and in the opinion of the examiner provides motivation to combine the references in the manner described above. The rejection stands.

B) Claim 49-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang '045, in view of Ikeda et al. EP 0087281, Sutherland et al. WO98/04650, Margerum et al. '568 and Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69, further in view of Wreede et al. '118 and Eguchi et al. JP 03-188479.

Wreede et al. '118 teaches the contact copying of the reflection holograms (225 and 229) where the incident beam (RB2) passes through the recording medium (235) and is diffracted to form beam (DB2) by the underlying reflection hologram. These include volume holograms in silver halide, dichromated gelatin and photopolymers. (9/8-22).

Eguchi et al. JP 03-188479 teaches the contact copying of the reflection hologram where the incident beam (4) passes through the recording medium (32) and is diffracted to form beam (41) by the underlying reflection hologram (22).

In addition to the basis provided above, the examiner cites Wreede et al. '118 and Eguchi et al. JP 03-188479 to further buttress the obviousness of the use of contact copying for reflection volume holograms asserted above.

The examiner relies upon the response above without further comment as no further arguments were directed at this rejection.

C) Claim 49-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 and Sutherland et al. WO98/04650, in view of Margerum et al. '568 Sturdevant '946 and Redfield '861.

Sturdevant '946 teaches a continuous process where the holographic recording medium is preexposed without any pattern using UV light (21), Then the hologram is exposed using a laser

and contact exposure through a holographic master (85) and then post exposed using a UV lamp. (91). The use of protective layers and a substrate is also disclosed with respect to figure 1.

Redfield '861 teaches that the precure to deplete the oxygen and reduce the induction period is disclosed. (10/5-11) If the holographic recording medium is not used soon after the precure, then it needs to be repeated but without causing polymerization as that would reduce the exposure range and hence possible diffraction efficiency of the hologram. (1/66-2/14 and 2/43-53) Similarly the fixation exposure can be carried out using the reference beam (12/1-20). The use of spatial light modulators is disclosed with respect to figure 1.

It would have been obvious to one skilled in the art to modify the contact copying processes disclosed by Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 by using a PDLC recording medium, such as that disclosed by Sutherland et al. WO98/04650 to form a electrically switchable hologram and to use a PDLC hologram as the master to enable the holographic master to be turned off during the precure of the acrylic photopolymers in the PDLC and the post cure to allow a uniform cure during these periods as discussed by Sturdevant '946 and Redfield '861 with a reasonable expectation of forming a useful PDLC holographic copy based upon Margerum et al. '568 which evidences contact exposure through a diffractive grating mask to form volume holographic patterns in PDLC recording materials and the use of an optical element (ie a mirror) to form an object beam is shown in Sutherland et al. WO98/04650 and from simple inspection, the position of the mirror in the cited portion of Sutherland et al. WO98/04650 is analogous to that of the holographic master in figure VII-2b of Caulfield, et al. "The Applications of Holography", (1970).

In this case, the examiner has cited Sturdevant '946 which provides motivation for a flood/uniform exposure followed by an interferometric/hologram exposure, where the flood exposure depletes the oxygen in the photopolymerizable composition and the ability to do this immediately before the interferometric/hologram exposure is beneficial as discussed by Redfield '861. The ability to perform these exposures successively while the master is in contact with the photopolymerizable holographic composition is operatble only when the holographic master is switchable as with the PDLC materials of Sutherland et al. WO98/04650 and Margerum et al. '568. This rejection is different form the others above. The rejection stands.

(10) Response to Argument

A) The applicant points out on pages 7-8 of the brief that none of the references cited teaches using an electrically switchable hologram as a master in a contact duplication process. The examiner agrees ad addresses these criteria in a point by point basis.

1) The motivation comes from the need to perform both a duplication/holographic exposure in addition to a non-holographic exposure. To form an edge faded hologram, as taught by Chang et al. the lower diffraction areas can be formed by maintaining overall exposure, but increasing the ratio of the non-holographic exposure to the holographic exposure, but this requires the use of diffuser plates which are moved to reduce the coherence of the exposure (figure 1, abstract and columns 4-5). A similar modification of the diffraction efficiency can be achieved using the scanning process of Ikeda et al., but the incident angle of the light must be controlled (page 11/col 1-4 and page 15/lines 19-25). Sutherland et al. teach control of the diffraction efficiency of the hologram between 0 and 100% using electrical switching (abstract and throughout). When

using a scanning contact exposure similar to that of Ikeda et al., the diffraction efficiency can be controlled electrically using the PDLC materials of Sutherland et al. as a function of the position of the copy beam, so that in the diffraction efficiency is decreased at the edges of the hologram being formed in the duplication process. (ie. the diffraction is high during exposures in the central region and decreased as the beam scans along the edge areas) The resultant edge fading process would not require control of the movement of a diffusion plate as with Chang et al. or fine control of the incident beam angle as discussed in Ikeda et al. The resulting hologram would be an electrically controllable edge faded hologram and would have the benefits ascribed to edge faded holograms by Chang et al. as well as those ascribed to electrically switchable PDLC holograms by Sutherland et al. (col 28/line 31-col. 29/line 3) and Margerum et al.
(col. 1/lines 14-34)

2) To address the issue of a reasonable expectation of success, one must appreciate that contact copying processes are old and well known in holography. This is evidenced by Ikeda et al. (figures 15-17) and Caulfield et al. (page 68, figure VII-2) which evidence the use of holographic masters in the formation of holographic duplicates. The teaching of the contact copying of grating pattern formed in as a mask in a PDLC material by Margerum et al. (col 5/lines 5-57) as an alternative to a two beam interferometric exposure addresses the issue of a PDLC materials being amenable to contact copying in forming a holographic article (a grating being a holographic mirror). The teaching by Sutherland et al. that PDLC materials can be made static by removing the LC material establishes that the PDLC holograms are merely conventional holograms with LC materials dispersed in them to render them electrically switchable (page 29/lines 4-22) and together with the teachings of Ikeda et al and Caulfield et al provide a

reasonable expectation of success in using PDLC materials in place of static holograms as a master hologram.

3) The examiner has cited where in the references the teachings are and so meets this criterion. The applicant argues otherwise and mistakenly interprets the examiner's discussion of the formation of a reflection hologram in the PDLC material by Sutherland et al. as being a mastering process. This position was set forth by the examiner to establish that forming reflection holograms with PDLC materials is known and to establish a similarity in the copying set up with that used in the duplication of a reflection hologram shown in VII-2(b) of Caulfield et al., as there is a beam incident upon each side of the holographic recording medium as opposed to the teachings of figure VII-2(a) of Caulfield et al., Ikeda et al and Margerum et al. which form transmission holograms as the reference and light diffracted by the master/grating are both incident upon the same side of the holographic recording medium. The mirror of Sutherland is the object being duplicated (a grating is a holographic mirror), but the examiner does not means to imply that the mirror has a holographic nature. As discussed above in section 2) Sutherland et al. does support the examiners position, by clearly establishing that the only difference in the electrically switchable holograms of Sutherland et al. and static holograms is the LC materials impregnated in them and that this can even be removed to render these static holograms (col. 29/lines 4-22) and so to one skilled in the art, there is a reasonable expectation of success in using these PDLC holograms as masters in holographic copying processes in manner similar to the use of static holograms taught by Ikeda et al. and Caulfield et al..

With respect to the assertions on page 9-12 (including the first "question" on page 11/line 34), that no motivation exists and "no problem" has been identified. There is an issue with

forming edge faded holograms which are switchable and how to effect both a holographic and non-holographic exposure of the same material. These switchable holograms would have the desirable edge fading described by Chang et al as well as the desirable electrical switchability described by Sutherland et al. and so motivation is present to form edge faded PDLC holograms. The applicant argues that the examiner has used the applicant's own specification as a blueprint, but the specification is devoid of any mention of edge faded holograms and so this assertion lacks and factual basis. The applicant argues that the examiner has made numerous technological leaps to reject the claims. The applicant's representative fails to appreciate that when the diffraction efficiency of 100%, all the light is diffracted, but that when the diffraction efficiency of 0% the light passes straight through the holographic article undiffracted. So when the examiner suggests decreasing the diffraction efficiency of the master when the copy beam is in the edge areas, the amount of exposure is maintained, but the amount of undiffracted light incident upon the (copy) holographic recording material is increased which is congruent with the cited teachings of Ikeda et al. and Chang et al. This is due to the reduced refractive index difference between the holographic fringes and the LC material. Sutherland et al. clearly describes the varying of the diffraction efficiency between 0 and 100%. The examiner has read the references with the common sense attributed to one of ordinary skill in the art, who would be expected to appreciate similarities between teachings of various references, particularly in the case of different ways to achieving a similar result. Clearly controlling a voltage with a dial is simpler than finely adjusting a beam angle or moving a diffuser in a controllable manner. This is similar to using a dimmer switch to control the lights in your home.

With respect to the second "question" (brief at page 12/ line 13), the issue of the interference pattern being reduced (along the edges) when either the coherence of the light is reduced (Chang et al.), the angle of incidence (Ikeda et al.) or the appropriate voltage is applied (Sutherland et al.) has been addressed immediately above, clearly turning the hologram off or down (reducing the diffraction efficiency) would decrease the amount of holographic exposure. The use of PDLC holographic recording materials does not require any wet processing form either development (Sutherland et al. at page 4/lines 19-21) or infusion of the LC material into the recorded hologram (Sutherland et al. at 1/28-37) and the use of dichromated holographic recording materials requires a wet development and a drying process (Chang et al. col. 6/lines 11-17). The Sutherland et al. reference when read by one of ordinary skill in the art provides a clear benefit in not requiring further processing beyond exposure to develop the holographic image, such as the development and drying taught by Chang et al. and specifically teaches the undesirability of further processing steps such as infusing a formed hologram with LC material. This in addition to the switchability of the PDLC material and the advantages ascribed to this by Sutherlandet al. (see for example pages 1-2) move one of ordinary skill in the art from the use of dichromated gelatin of Chang et al. '045 and to the PDLC material of Sutherland et al.. Further, Margerum et al. (col. 1/lines 14-34)
describes the desirability of the use of PDLC materials is automobile displays which is one of the uses described by Chang et al. (col. 1/lines 15-54). So there is a reasonable expectation that an edge faded PDLC holograms would be desirable for this application.

With respect to "Question" 3 (brief at page 12/line 28), the applicant argues that Chang et al. does not describe copying and Ikeda et al. does not use an electrically switchable master and

where is the motivation to make the substitution of the electrically switchable master for the either beam angle variation (Ikeda et al.) or the movement of a diffuser (Chang et al.). The answer of why to use copying methods can be found in Caulfield et al. which states on page 67-68, that multiple copies can be made for mass markets or for uses which might damage the original, to change form one recording composition to another or to change the hologram to a different form or record a processed image. Clearly in the statement of rejection, the resultant edge faded PDLC hologram would be a different form from the PDLC master and copying would allow the formation of a larger number of duplicates to be placed in a larger number of vehicles which are two among the advantages of copying described by Caulfield et al. The issue of the equivalence of the different techniques of increasing the non-holographic proportion of the exposure has been addressed above, with respect to the first question and will not be repeated needlessly.

With respect to "question" 4 (brief at page 13/line 5), this is substantially a rephrasing of the questions above. The issue of the equivalence of the different techniques of increasing the non-holographic proportion of the exposure has been addressed above, with respect to the first question and will not be repeated needlessly. Clearly, to form an edge faded hologram form a hologram with varying diffraction efficiency from a uniformly diffractive master the amount of diffraction from the master will have to be controlled as a function of the scanning light on the master hologram surface as discussed by Ikeda et al. (11/1-4 and 15/19-25), but in the case where an electrically controllable PDLC hologram ,such as that taught by Sutherland et al., is used as the master the voltage to the master can be controlled so that the diffraction efficiency of the

(entire) hologram is decreased when the scanning beam is in the edge region in lieu of controlling the beam angle.

With regard to "question" 5, this is merely a restatement of the question 4 and portions of the other "questions". The **complete** statement of rejection is repeated below:

It would have been obvious to one skilled in the art to modify the process of forming edge faded holograms taught by Chang '045 by using contact copy methods such as those disclosed by Ikeda et al. EP ***0087281 to obviate the need to a two beam exposure apparatus*** *and to use the PDLC holograms of Sutherland et al. WO98/04650 as the master transmission hologram and as the duplicate material and to vary the diffraction efficiency of the holographic master based upon the location of the beam to form edge faded* ***holograms to obviate the need for diffusers or varying the angle of the beam as a function of the location of the laser beam used in the scanning copy process of Ikeda et al. EP 0087281*** *with a reasonable expectation of forming a edge faded hologram with the desired diffraction efficiency distribution in a PDLC holographic recording medium, which can be turned on or off. The examiner cites Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 to establish that contact copying is old and well known, Ikeda et al. EP 0087281 to evidence that this extends to volume holographic recording media, Margerum et al. '568 which* ***evidences contact exposure through a diffractive grating mask to form volume holographic patterns in PDLC recording materials.*** *Sutherland et al. WO98/04650 where a holographic mirror is recorded using a laser to produce the incident reference beam and a mirror on the opposite side the recording medium to reflect the reference beam back through the recording medium to form the object beam, which interferes with the reference beam to form the interference fringes (17/1-12) effectively demonstrates the use of an*

adjacent optical element to generate the object beam for volume holographic recording. The resultant PDLC volume hologram would be modified in the non-uniform diffraction efficiency relative to the master PDLC hologram, which relates to the motivation to change the hologram to a different form as motivation to use a copying process. ***The electrical control of the diffraction efficiency in a PDLC is clearly easier that moving a diffuser as taught by Chang '045 or varying the incident angle of the replay beam taught by Ikeda et al. EP 0087281 to generate the areas of reduced diffraction efficiency.***

In addition to the basis provided above, the examiner notes that it would have been obvious to modify the resultant process by reversing the positions of the PDLC holographic master and the PDLC recording material and to use of reflection PDLC holographic master, rather than a transmission PDLC holographic ***master to form a edge faded reflection PDLC hologram*** *based upon the teachings of Caulfield, et al. "The Applications of Holography", (1970), pp. 66-69 regarding the use of contact exposure copying methods which is also old and well known. The examiner further notes that the use of an optical element (ie a mirror) to form an object beam is shown in Sutherland et al. WO98/04650 and from simple inspection, the position of the mirror in the cited portion of Sutherland et al. WO98/04650 is analogous to that of the holographic master in figure VII-2b of Caulfield, et al. "The Applications of Holography", (1970). In the case Chang '045, interference pattern formation is prevented at the edges by rendering the percentage of exposure less coherent in these areas which is the same effect achieved by reducing the diffraction efficiency of the grating when exposure of the edge regions occurs as more of the light merely passes through the hologram when the diffraction efficiency is reduced and by further replacing the holographic recording material of Ikeda et al. EP 0087281*

or Chang '045 with a PDLC holographic recording material to produce a switchable hologram with faded edges ***so that it could be turned off when it was not desired to be in the drivers view and processing without the need for wet development.***

The applicant's analysis is piecemeal similar to the piecemeal treatment of the references and it has been held that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). By removing the context of the statements, the applicant attempts to show the combination as disparate and merely conclusionary. The motivational portions of the statement of rejection above have been bolded to show the assertion that it is merely conclusionary is without merit. Further, the prosecution record shows that the issues raised by the applicant have been addressed and similarities in the teachings of the references discussed. The examiner believes that the references teach the invention bounded by the claims, provide motivation to make the modification asserted by the examiner to render the invention obvious over the prior art and evidence a basis for a reasonable expectation that the resulting process would function.

B) The applicant states (brief at page 15) that the secondary references applied (Wreede et al. and Eguchi et al. JP 03-188479) fails to cure the defects of the other references addressed above. The examiner disagrees that there are any defects, but had cited these to further establish a reasonable likelihood of success when volume holograms are used in contact copying processes for forming a reflection hologram where the incident light (reference beam) passes

through the duplicate recording material and is reflected off the master to form the second (object) beam and the holographic pattern.

C) The applicant argues (brief at pages 15-16) that this line of rejection is defective not including all the of the references applied in the other rejection. There is a second reason to use a non-holographic exposure with photopolymerizable materials, such as the acrylate materials of Sutherland et al. WO98/04650, Margerum et al. '568, Sturdevant '946 and Redfield '861 as these are susceptible to an induction period where exposure initially depletes the oxygen present in the recording layer as discussed in Sturdevant et al. and Redfield et al. This exposure can be a uniform by a laser as discussed in Sturdevant et al. and Redfield et al. The use of a uniform exposure allows the oxygen in the medium to be depleted throughout the entire medium, where an imagewise exposure would only deplete the oxygen in the exposed area. The curing/fixation exposure is similarly uniform. In this case, the entire master PDLC hologram would be turned off, the uniform exposure performed, the master PDLC hologram would be turned on and the duplication exposure performed and then the master PDLC hologram would be turned off and the fixation exposure performed to form a duplicate PDLC hologram from the PDLC holographic master. The advantages of copying being discussed by Caulfield et al. and the advantages of PDLC holograms being discussed by Margerum et al. and Sutherland et al. As the process taught is found in other references and the process of forming a non-uniform hologram taught by Ikeda et al. is not used, this reference is not applied.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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